

Further Studies on Cestodes of Japanese Bats, with Descriptions of Three New Species of the Genus *Vampirolepis* (Cestoda: Hymenolepididae)¹

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ABSTRACT—Three new and three known species of hymenolepidid cestodes are recorded from bats collected at various places in Japan in 1986. *Vampirolepis rikuchensis* sp. n. from *Myotis hosonoi* from Ichinohe-chô, Iwate Prefecture, closely resembles *V. ogaensis* Sawada, 1974, but differs from it in smaller rostellar hooks (0.018 vs. 0.021 mm), thicker outermost chorion (tough vs. thin), surface structures of eggs (smooth vs. rough) and position of genital pores (located a little anterior to middle vs. middle). *V. kaguyae* sp. n. from *M. frater kaguyae* from the same locality, closely resembles *V. yoshiyukiae* Sawada, 1980, but differs from it in larger suckers, larger rostellum, larger rostellar sac, and longer rostellar hooks (0.032 vs. 0.0245 mm). *V. yakushimaensis* sp. n. from *Murina aurata ussuriensis* from Yakushima, Kagoshima Prefecture closely resembles *V. iriomotensis* Sawada, 1983, but differs from it in shape of ovary (pentalobate or hexalobate vs. trilobate), morphological feature of egg inner membrane (provided with polar filaments vs. no polar filaments) and longer embryonic hooks (0.018 vs. 0.014 mm).

INTRODUCTION

As a continuation of my serial studies on the cestode parasites of the Japanese bats, the present paper reports three new and three known hymenolepidid cestodes from bats collected at various localities, except Hokkaido and Shikoku, in Japan in 1986.

MATERIALS AND METHODS

The bats were captured alive and autopsied immediately at the collecting sites (Fig. 1). Their alimentary canals were cut open to extract endoparasites as soon as possible and fixed in Carnoy's fluid and brought back to my laboratory. After being soaked in 45% acetic acid for about 1 hr for expanding, they were stored in 70% alcohol. Cestodes obtained from these alcohol-preserved guts were stained with alcohol-hydrochloride-carmin, dehydrated in alcohol, cleared in xylene, and mounted in Canada balsam. Measurements

are given in millimeters.

RESULTS

The localities and dates of bats examined and cestodes obtained are shown in Table 1.

Vampirolepis Spassky, 1954
Vampirolepis rikuchensis sp. n.
(Figs. 2-5)

From June 17 to July 7, 1986, five specimens of Hosono's whistled bat, *Myotis hosonoi*, were captured by Mukooyama around street lamps at Ichinohe-chô, Iwate Prefecture. On dissection, one of them was found infected with two mature and one juvenile specimens of this cestode.

Description: Medium-sized hymenolepidid; mature worms 24-43 in length and 0.8-1.1 maximum width. Metamerism distinct, margins serrate. Proglottids wider than long. Scolex 0.245-0.280 long and 0.273-0.287 wide, not sharply demarcated from strobila. Rostellum pyriform, 0.126 long by 0.070-0.091 wide, armed with a crown of 29-30 spanner-shaped hooks measuring 0.018 long. Hook handle long and attenuate; guard

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TABLE 1. Localities and dates of bats examined and their cestode parasites in 1986

Host species Cave and locality ¹	Date	Number of bats		Cestode species
		examined	infected %	
Rhinophiliidae				
(1) <i>Rhinolophus cornutus cornutus</i>				
8) Mizunashi-dô Maebaru-chô, Fukuoka Pref.	Oct. 19	10	0	0
10) Gongenyama-dô Himeto-machi, Kumamoto Pref.	Dec. 7	16	9	56
11) Disused air-raid shelter Nishinoomote-shi, Tanegashima, Kagoshima Pref.	Dec. 11	11	2	18
12) Sea-eroded cave Minamitane-chô, Tanegashima, Kagoshima Pref.	Dec. 25	2	1	50
(2) <i>Rhinolophus cornutus orii</i>				
14) Abandoned mine Ryugô-son, Amamiôshima, Kagoshima, Pref.	July 28	13	3	23
15) Raceway Yamato-son, Amamiôshima, Kagoshima, Pref.	July 29	10	0	0
16) Disused air-raid shelter Kakeroma, Amamiôshima, Kagoshima, Pref.	July 30	1	0	0
(3) <i>Rhinolophus pumilus</i>				
18) Abandoned mine Nago-shi, Okinawa Pref.	July 25	25	0	0
20) Onaga-dô Gushichan-son, Okinawa Pref.	July 24	20	0	0
(4) <i>Rhinolophus ferrumequinum nippon</i>				
2) Snow tunnel Ooyama-chô, Toyama Pref.	July 25	1	1	100
4) Deserted house Jôhana-chô, Toyama Pref.	Aug. 2	7	5	75
6) Abandoned mine Ikeda-shi, Ôsaka Pref.	Nov. 9	1	1	100
8) Mizunashi-dô Gongenyama-dô	May 24	10	7	70
	Dec. 7	1	1	100
Vespertilionidae				
(5) <i>Miniopterus schreibersii fuliginosus</i>				
5) Abandoned mine Shiga-chô, Ishikawa Pref.	Aug. 15	5	0	0
9) Disused air-raid shelter Misumi-chô, Kumamoto Pref.	Oct. 28	5	2	40
10) Gongenyama-dô	Dec. 7	5	3	60
(6) <i>Miniopterus schreibersii blepotis</i>				
	Dec. 7	5	2	40
				<i>V. hidaensis</i>
				<i>V. hidaensis</i>
				<i>H. rashomonensis</i>
				<i>H. rashomonensis</i>
				<i>H. rashomonensis</i>
				<i>H. rashomonensis</i>

17) Erabu-dô Chinan-chô, Okinoerabu, Kagoshima Pref.	July 28	10	0	0	
19) Itokazu-dô Tamagusuku-son, Okinawa Pref.	July 31	10	1	10	<i>V. hidaensis</i>
(7) <i>Myotis hosonoi</i>					
1) Street lamps Ichinohe-chô, Iwate Pref.	June 17-July 1	5	2	40	<i>V. rikutsuensis</i> sp. n.
3) Forest Ooyama-chô, Toyama Pref.	July 30	1	0	0	
(8) <i>Myotis frater kaguyae</i>					
1) Street lamps Forest	June 17-20 July 30	5 1	1 1	20 100	<i>V. kaguyae</i> sp. n. <i>V. sp.</i> (juvenile, unidentified)
(9) <i>Murina aurata ussuriensis</i>					
13) Abandoned gold mine Kamiyaku-chô, Yakushima, Kagoshima Pref.	Dec. 26	1	1	100	<i>V. yakushimaensis</i> sp. n.
(10) <i>Murina leucogaster hilgendorfi</i>					
7) Abandoned mine Nose-chô, Ôsaka Pref.	Nov. 9	1	0	0	

¹ Locality numbers correspond to those in Fig. 1.

prominent, round at its end, slightly shorter than blade; blade sharp at its end. Rostellar sac slightly elongate, 0.189 long by 0.133-0.161 wide, extending posterior to suckers. Suckers discoid, 0.091-0.105 in diameter.

Genital pores unilateral, located a little anterior to the middle of proglottid margin. Testes three in number, ovoid, 0.098-0.112 long by 0.056-0.070 wide, arranged in a transverse row, one poral and two aporal. Cirrus sac club-shaped, attaining a size of 0.154 long by 0.042 wide, filled with internal seminal vesicle measuring 0.070-0.077 long by 0.035 wide. External seminal vesicle 0.112 long by 0.065 wide. Ovary transversely elongate, 0.308-0.315 wide, located anterior half of proglottid. Vagina opening in genital atrium, extending medially, then enlarging and forming seminal receptacle. Seminal receptacle 0.070-0.077 long by 0.049-0.056 wide. Vitelline gland compactly lobate, 0.140 by 0.056, located posterior to ovary. Uterus arising directly from ovarian lobe as a lobed sac, gradually enlarging, filling all available space in senile proglottids. Eggs spherical or ellipsoidal, 0.049-0.053 by 0.042-0.046, surrounded by four envelopes; outermost chorion thick and with smooth surface. Onchospheres spherical 0.032-0.035 in diameter; embryonic hooks 0.014 long.

Type host: *Myotis hosonoi* Imaizumi, 1954.

Site of infection: Small intestine.

Type locality and date: Ichinohe-chô, Iwate Prefecture; June 17, 1986.

Type specimen: Holotype: NSU Lab. Coll. No. 8701. Paratypes: 8702.

Remarks: The present new species, *V. rikuchiuensis* closely resembles *V. ogaensis* Sawada, 1974 [1] from *Rhinolophus ferrumequinum nippon* in the shapes of scolex, rostellum, rostellar sac and rostellar hooks. However, it differs from *V. ogaensis* in smaller rostellar hooks (0.018 vs. 0.021), thicker outermost chorion of eggs (tough vs. thin), the surface structure of eggs (smooth vs. rough) and the position of genital pores (located a little anterior to the middle vs. the middle).

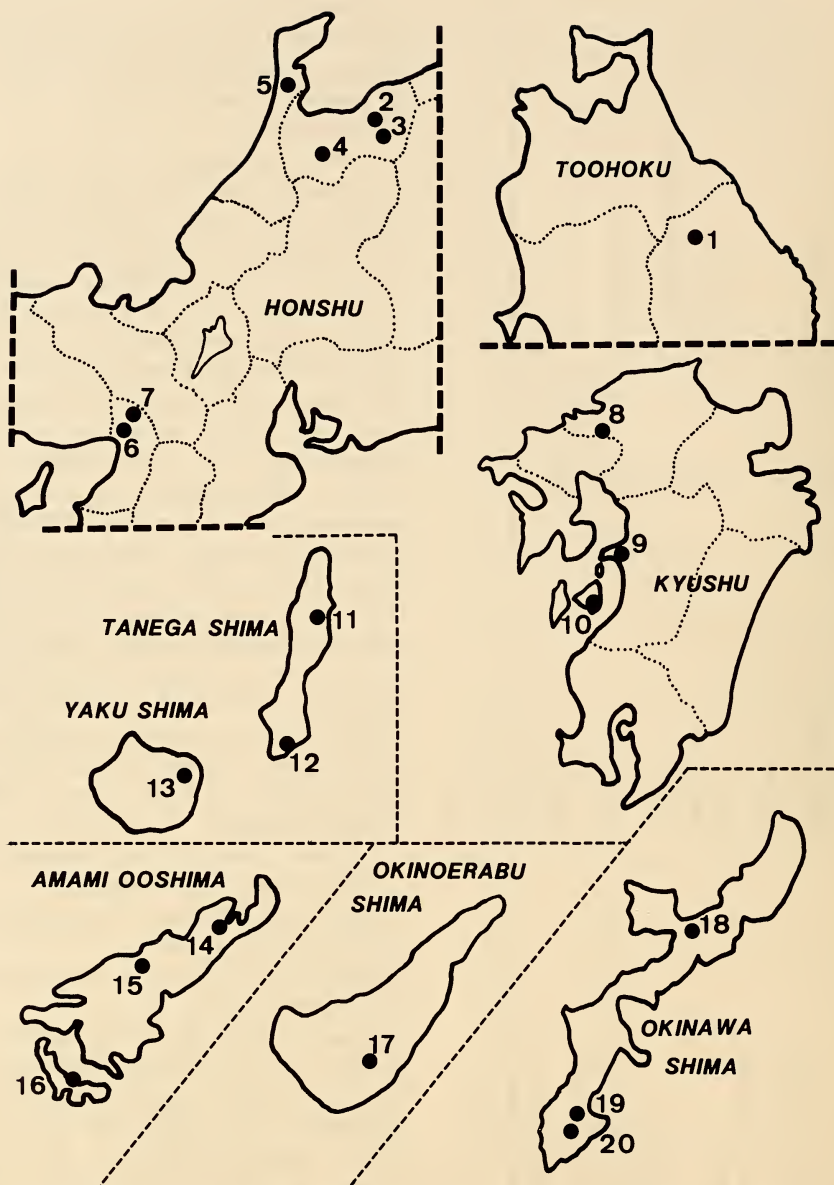


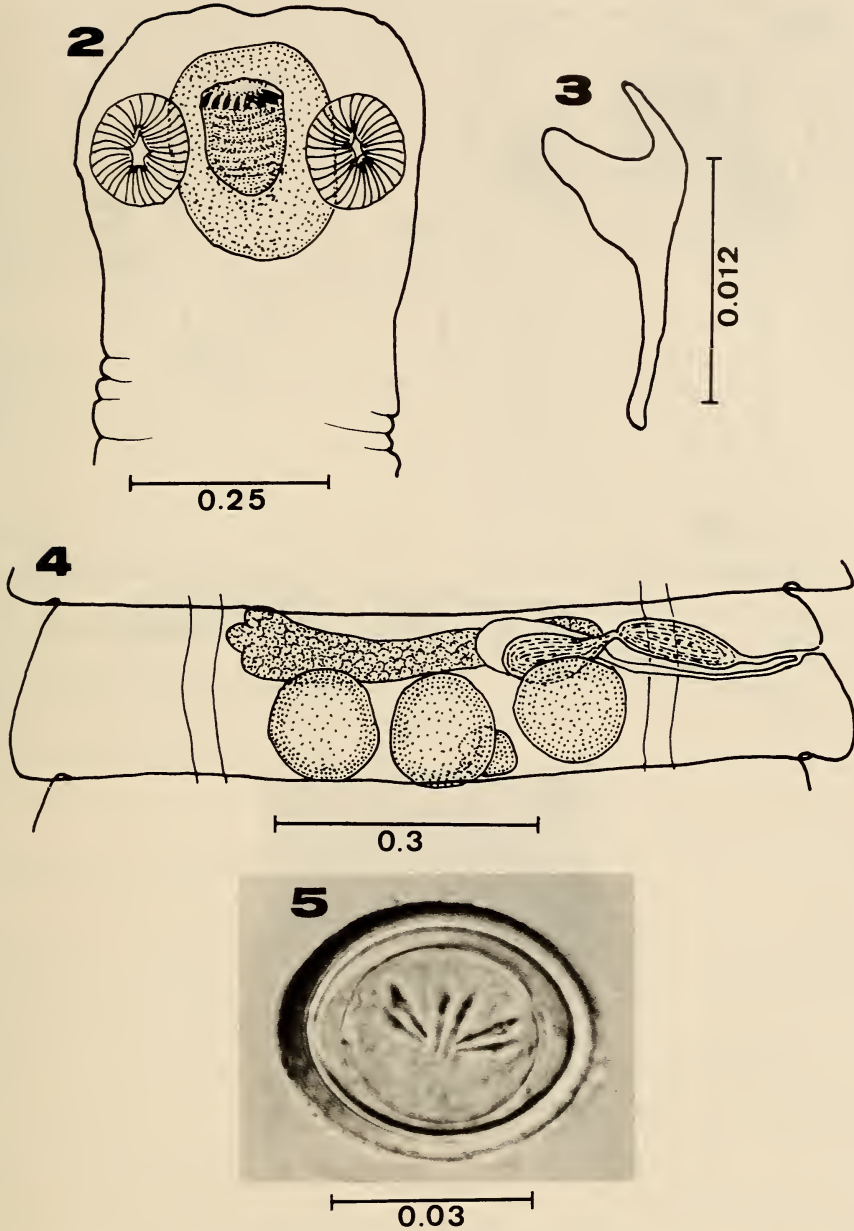
FIG. 1. Map showing the collection sites of bats. For the locality number, see Table 1.

Vampirolepis kaguyae sp. n.
(Figs. 6-9)

Of five long-legged whiskered bat, *Myotis frater kaguyae*, captured by Mukooyama around street lamps at Ichinohe-chô, Iwate Prefecture, June 17

to 20, 1986, one was found infected with one mature specimen of this cestode.

Description: Medium-sized hymenolepidid; strobila length 45; maximum width 1.6. Metamerism distinct, craspedote, margins serrate. Proglottids wider than long. Scolex 0.280 long by 0.135



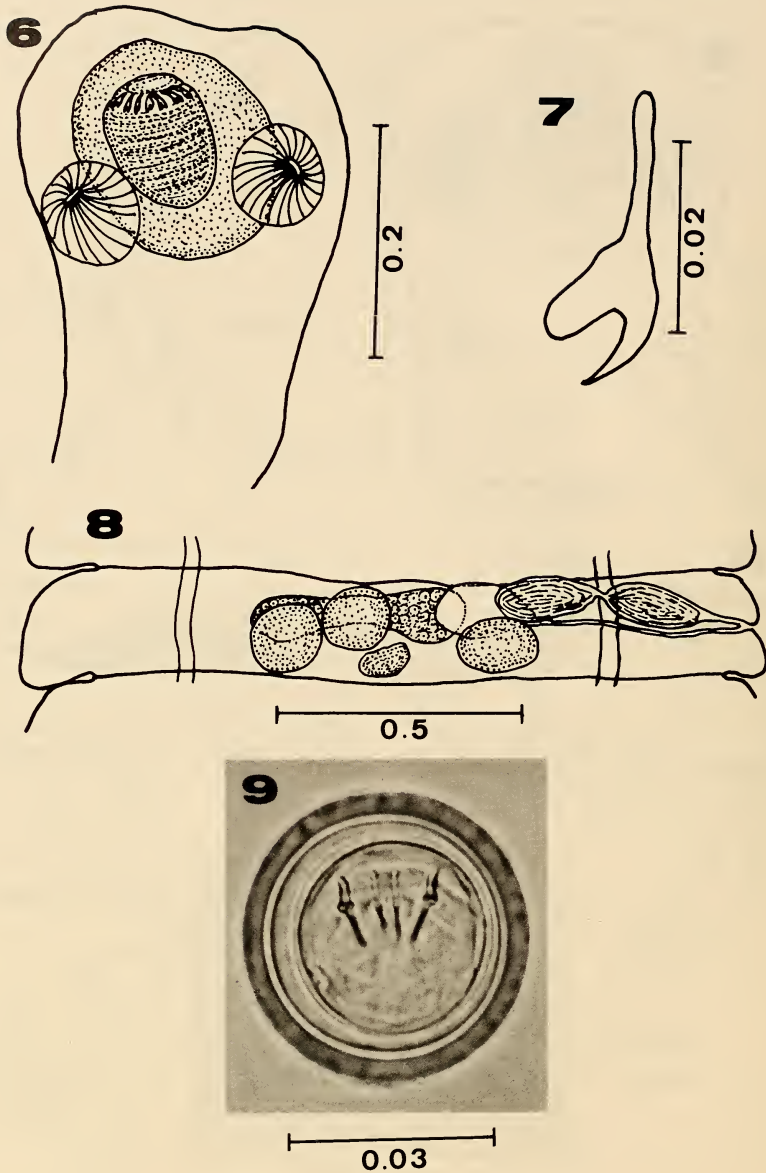
FIGS. 2-5. *Vampirolepis rikuchuensis* sp. n.

2: Scolex. 3: Rostellar hooks. 4: Mature proglottid, dorsal view. 5: Ripe egg. Scales in mm.

wide, slightly set off from neck. Rostellum pyriform, 0.140 long and 0.112 wide, armed with a single row of 35 spanner-shaped hooks measuring 0.032 long. Hook handle long, attenuate; guard prominent, round at its end, slightly shorter than

blade; blade sharp at its end. Rostellar sac 0.217 long by 0.182 wide, when the rostellum is invaginated. Suckers round, 0.105 in diameter.

Genital pores unilateral, located a little posterior to the middle of proglottid margins. Testes



FIGS. 6-9. *Vampirolepis kaguyae* sp. n.

6: Scolex. 7: Rostellar hook. 8: Mature proglottid, dorsal view. 9: Ripe egg. Scale in mm.

three in number, spherical, 0.077-0.091 long by 0.063-0.077 wide, arranged in a transverse row, one poral and two aporal. Cirrus sac slightly elongate, 0.154-0.175 long and 0.049-0.056 wide, extending to longitudinal excretory canals. Internal seminal vesicle 0.112-0.119 long by 0.049-

0.056 wide, enlarging to fill proximal portion of cirrus sac. External seminal vesicle slightly elongate, 0.104-0.175 long by 0.070-0.077 wide, extending to poral testis and dorsal to seminal receptacle. Vagina opening in genital atrium, extending to median field, then enlarging to

forming voluminous seminal receptacle measuring 0.112–0.133 long by 0.070–0.084 wide. Ovary transversely elongate, 0.280–0.287 wide. Vitelline gland compact, directly posterior to ovary, 0.077–0.091 long by 0.035–0.049 wide. Eggs spherical, 0.042 in diameter, surrounded by four envelopes; outermost chorion thick and with smooth surface. Onchospheres spherical, 0.028 in diameter; embryonic hooks 0.011 long.

Type host: *Myotis frater kaguyae* Imaizumi, 1956.

Site of infection: Small intestine.

Type locality and date: Ichinohe-chô, Iwate Prefecture: June 17, 1986.

Type specimen: Holotype NSU Lab. Coll. No. 8703.

Remarks: The present new form, *V. kaguyae*, closely resembles *V. yoshiyukiae* Sawada, 1980 [2] from the same species bat collected at Oze, Gunma Prefecture, in the shape and number of rostellar hooks. However, it differs from *V. yoshiyukiae* in larger suckers (0.105 in diameter vs. 0.056–0.070), larger rostellum (0.140 by 0.112 vs. 0.070 by 0.056), larger rostellar sac (0.217 by 0.180 vs. 0.046 by 0.054), and longer rostellar hooks (0.032 vs. 0.0245).

Vampirolepis yakushimaensis sp. n.

(Figs. 10–14)

On December 26, 1986, one lesser tube-nosed bat, *Murina aurata ussuriensis*, was collected in an abandoned gold mine at Kamiyaku-chô, Yakushima, Kagoshima Prefecture. The bat was found infected with 13 mature specimens of this cestode. The cestode is the first to be reported from this species bat from Japan.

Description: Small-sized hymenolepidid; mature worms 25–30 long and 1.0–1.2 maximum wide. Metamerism distinct, craspedote, margins serrate. Scolex clavate, 0.105–0.154 long and 0.259–0.315 wide, not sharply demarcated from strobila. Rostellum 0.049–0.077 long and 0.063–0.084 wide, armed with a single circle of 28–35 spanner-shaped hooks measuring 0.021 long. Hook handle slender; guard prominent, round at its end, slightly shorter than blade; blade remarkably sharp at its end. Rostellum retractable into

rostellar sac measuring 0.119–0.140 long and 0.119–0.126 wide. Unarmed suckers round, 0.070–0.084 in diameter. Neck region behind scolex 0.22–0.28 long and 0.28 wide. Mature and gravid proglottids much broader than long.

Genital pores unilateral and located a little anterior to middle. Testes three in number, subspherical, 0.070–0.084 long by 0.084–0.105 wide, arranged in a form of triangle, one poral and two aporal, not in contact with longitudinal osmoregulatory canals laterally. Cirrus sac cylindrical, 0.154–0.270 long and 0.032–0.056 wide, positioned anteromedial from genital atrium, extending beyond osmoregulatory canals. Internal seminal vesicle 0.124–0.138 long by 0.056 wide, occupying almost whole of cirrus sac. External seminal vesicle 0.111–0.126 long by 0.042–0.055 wide. Ovary pentalobate or hexalobate, 0.182–0.189 wide. Vitelline gland lying posterior to ovary, irregularly lobate, 0.028–0.035 long by 0.070–0.077 wide. Seminal receptacle saccate, 0.126–0.140 long by 0.070–0.084 wide, overlapping poral testis. Uterus arising directly from ovarian lobes as a lobe sac, gradually enlarging, filling whole gravid proglottid. Ripe eggs elliptical; outermost chorion thin, 0.056–0.060 in major axis and 0.042–0.046 in minor axis; inner membrane 0.032–0.035 by 0.028–0.032, with at each pole a round projection provided with polar filaments. Onchospheres subspherical, 0.025–0.028 by 0.028–0.032; embryonic hooks 0.018 long.

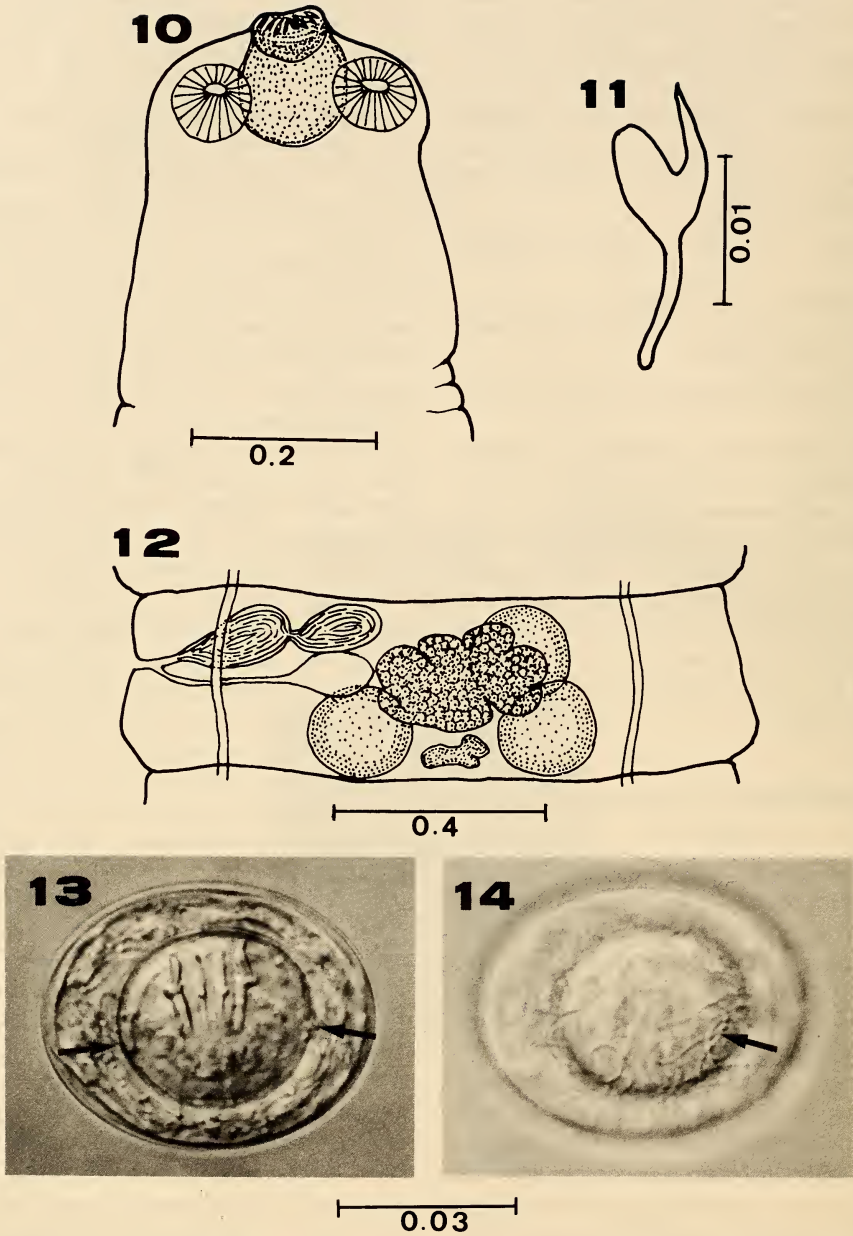
Type host: *Murina aurata ussuriensis* Ognev, 1913.

Site of infection: Small intestine.

Type locality and date: Kamiyaku-chô, Yakushima, Kagoshima Prefecture; December 26, 1986.

Type specimen: Holotype: NSU Lab. Coll. No. 8704. Paratypes: No. 8705.

Remarks: The present new species, *V. yakushimaensis* closely resembles *V. iriomotensis* Sawada, 1983 [3] from *Rhinolophus imaizumii* in the number and length of rostellar hooks. However, it differs from *V. iriomotensis* in the shape of ovary (pentalobate or hexalobate vs. transversely elongated and trilobate), the morphological feature of egg inner membrane (provided with polar filaments vs. no polar filaments) and in longer embryonic hooks (0.018 vs. 0.014).



FIGS. 10-14. *Vampirelepis yakusimaensis* sp. n.

10: Scolex. 11: Rostellar hook. 12: Mature proglottid, ventral view. 13: Ripe egg, showing a projection (arrow) of the inner membrane provided with polar filaments. 14: Ripe egg, showing polar filaments (arrow). Scale in mm.

Vampirolepis isensis Sawada, 1966 [4]

Host: *Rhinolophus cornutus cornutus* and *R. c. orii*. For localities, see Table 1 and Figure 1.

Vampirolepis hidaensis Sawada, 1976 [5]

Host: *Miniopterus schreibersii fliginosus* and *M. s. blepotis*. For localities, see Table 1 and Figure 1.

Hymenolepis Weinland, 1858***Hymenolepis rashomonensis*** Sawada, 1972 [6]

Host: *R. ferrumequinum nippon*. For localities, see Table 1 and Figure 1.

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